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ECOLOGY OF SUNKEN WOOD COMMUNITY IN THE OCEAN

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【INTRODUCTION】

Nowadays, important ecological habitats continue to be destructed and declined by human activities. For example, the decrease of the forest cover threats various animals which depend on the resources originated from the forest. The effect is not limited to the terrestrial ecosystems. By floods, lots of coarse woody materials are washed out from the land, flow into rivers and transported to the sea. These coarse woody materials harbor dense and diverse assemblages of macro-invertebrates on the sea floor. Then, the reductions of the forest cover decrease woody supply to the sea, and must affect the marine ecosystem. However, coarse woody debris has been often ignored component of marine ecosystem, and its ecological roles have not been clarified.

【MATERIAL & METHODS】

1) Sunken woods were collected from continental shelves around 150 to 250 meter-deep seafloor in Kumano Nada and Suruga Bay using a trawl net operated by fishing boat. To clarify whether the organic materials derived from woods contribute to the associated fauna as their food source, I analyzed carbon and nitrogen stable isotope ratios of macro-invertebrates collected from wood samples.

2) To clarify the wood fragmentation process by marine wood borers and the succession of the sunken wood community, I carried out long-term field experiments using artificially immersed wood logs.

54 pairs of cedar and oak logs (10 cm in diameter and 20 cm in length with bark) were placed on the 2-meter-deep seafloor in Tanabe Bay in September 2008. Three sets of wood logs were recovered every two months for the first 16 months and every four months thereafter to 48 months.

Two cedar logs were dropped to the 500-meter-deep seafloor in Nansei Shoto Trench in July 2009. One of the samples was recovered, and another cedar log was newly deployed in April 2010. Recovery of the rest of two samples took place in January 2012. These operations were conducted with the cooperation of Japan Marine Science and Technology Center.

Wood samples were broken into small pieces, and macro-invertebrates

were collected for the analyses. The time-series data of abundance of macro-invertebrates were clustered based on a Bray-Curtis similarity matrix using a group average linkage method (Cluster analysis). Similarity percentage (SIMPER) procedures were performed to assess the percentage contribution of each taxonomic group to the similarity within, and dissimilarity between stages.

【RESULTS & DISCUSSION】

1) The mean isotopic values of wood-boring bivalves were $\delta^{13}C$: -24.14±0.38‰ (n=13) and $\delta^{15}N$: 4.05±0.27‰ (n=11). The value of $\delta^{15}N$ was close to that of their host wood (1.97±1.87%, n=7) and lower than that of suspension feeders (10.35±0.30, n=2), suggesting that wood-boring bivalves use neither their host wood nor suspended particles as their nitrogen source. Given ambient nitrogen gas value ($\delta^{15}N$: around 0.5%), nitrogen fixing endosymbiotic bacteria were most likely the major nitrogen source. As a carbon source, wood-boring bivalves can digest cellulose, one of the components of wood. The $\delta^{13}C$ value of cellulose is known to be1 to 2‰ higher than that of wood (-26.85±1.13%, n=7), and it appears to be around -25‰. Then, cellulose is most likely their main carbon source. The mean $\delta^{13}C$ value of the other trophic groups (-23.29±0.99%, n=27) suggests that cellulose is a major carbon source of the community.

2) The cedar logs deployed in the shallow water were completely fragmented by wood-borers through the following processes; Stage I: early settlement of the wood borers, Stage II: rapid fragmentation of wood from its inside by wood-boring bivalves, Stage III: death of the wood-boring bivalves, Stage IV: intensive attack to the surface of wood, Stage V: collapse of wood from the surface, Stage VI: disappearance of wood. The oak logs deployed in the shallow water and the cedar logs placed on the deep-sea floor have not reached to Stage IV within the period of the experiments. This was considered to be a result of the absence of the limnorids which played a major role in Stage IV. The wood-boring bivalves, instead of the limnorids, repeatedly settled on the wood logs and gradually disintegrated the wood from its surface.

The availability of food resources and microhabitats for the species composed of the sunken wood community drastically changed through the wood fragmentation process. In the shallow water, there were significant differences in species composition and abundance in the sunken wood

communities among different stages of the process. However, these differences were mainly attributed not to the wood-boring activities but to the development of the sessile community. Reducing condition also affected the species composition and its abundance of the community. On the surface of oak logs, the reducing condition was steadily maintained through the bacterial degradation of their extractives.